

## CLAIMS

What is claimed is:

1. A CD-DVD compatible optical pickup, comprising:

an optical output module having a mount and first and second light sources, positioned adjacent to each other on the mount emitting light beams having different wavelengths;

an objective lens focusing light emitted from the first and second light sources onto two types of optical recording media;

an optical path conversion unit positioned on an optical path between the optical output module and the objective lens, converting a traveling path of incident light;

a photodetector receiving the light beams emitted from the first and second light sources, reflected from the optical recording media, and passed through the optical path conversion unit, detecting a data signal and an error signal; and

an actuator having a movable member in which the objective lens is installed, moving the objective lens in a direction to compensate a focusing error signal and a tracking error signal, the actuator rolling the movable member, in a case where recording and/or reproduction of data is performed, using a light beam deviated from a main axis of the objective lens among the light beams emitted from the first and second light sources.

2. The CD-DVD compatible optical pickup of claim 1, wherein the actuator includes:

a base on which the optical output module, the optical path conversion unit, and the photodetector are installed;

a holder installed on the base;

a plurality of elastic members, each having one end coupled to the holder and another end coupled to the movable member such that the movable member is supported movably, and having different stiffnesses with respect to the center of the objective lens such that the movable member asymmetrically moves in a focusing direction of the optical recording media; and

a magnetic driving unit driving the movable member in the focusing direction and a tracking direction of the optical recording media due to an electromagnetic force of the magnetic driving unit.

3. The CD-DVD compatible optical pickup of claim 2, wherein the stiffness of the elastic member positioned nearer an inner circumference of the optical recording media, with respect to the radius direction of the optical recording media, is different from that of the elastic member positioned nearer an outer circumference of the optical recording media due to a difference in thickness between the plurality of elastic members.

4. The CD-DVD compatible optical pickup of claim 2, wherein the stiffness of the elastic member positioned nearer the outer circumference is less than that of the elastic member positioned nearer the inner circumference.

5. The CD-DVD compatible optical pickup of claim 2, wherein the magnetic driving unit includes:

- focusing coils and tracking coils installed on the moving member; and
- a magnet generating the electromagnetic force driving the movable member in the focusing direction and the tracking direction of the optical recording media due to an interaction between the magnet and a current flowing in the focusing coils, and an interaction between the magnet and a current flowing in the tracking coils.

6. The CD-DVD compatible optical pickup according to claim 2, wherein the electromagnetic force suppresses the actuator rolling the movable member.

7. The CD-DVD compatible optical pickup of claim 1, wherein the actuator includes:  
a base on which the optical output module, the optical path conversion unit, and the photodetector are installed;

- a holder installed on the base;

- a plurality of elastic members, each having one end coupled to the holder and another end coupled to the moving member such that the movable member is supported movably, the length of the elastic member positioned nearer an inner circumference of the optical recording media with respect to the radius direction of the optical recording medium being different from that of the elastic member positioned nearer an outer circumference of the optical recording medium such that the movable member asymmetrically moves in a focusing direction of the optical recording media; and

- a magnetic driving unit driving the movable member in the focusing direction and a tracking direction of the optical recording media by an electromagnetic force.

8. The CD-DVD compatible optical pickup of claim 7, wherein the length of the elastic member positioned nearer the outer circumference is longer than that of the elastic member positioned nearer the inner circumference.
9. The CD-DVD compatible optical pickup of claim 7, wherein the magnetic driving unit includes:
  - focusing coils and tracking coils installed on the moving member; and
  - a magnet driving the movable member in the focusing direction and the tracking direction of the optical recording media due to an interaction between the magnet and a current flowing in the focusing coils, and an interaction between the magnet and a current flowing in the tracking coils.
10. The CD-DVD compatible optical pickup according to claim 1, wherein the light reflected from a CD is on-axis light and light reflected from a DVD is off-axis light.
11. The CD-DVD compatible optical pickup according to claim 1, wherein the light reflected from a CD is off-axis light and light reflected from a DVD is on-axis light.
12. The CD-DVD compatible optical pickup according to claim 1, wherein the actuator rolling the movable member forms a substantially circular spot on at least one of the two types of optical recording media.
13. The CD-DVD compatible optical pickup according to claim 1, wherein an adjustment in an angle of inclination of the movable member forms a substantially circular spot on at least one of the two types of optical recording media.
14. An optical recording and/or reproducing apparatus, comprising:
  - a spindle motor rotating an optical recording medium positioned in a turntable;
  - an optical pickup installed to be movable in a radius direction of the optical recording medium and performing recording and/or reproduction of data with respect to the optical recording medium;
  - a driving unit driving the spindle motor and the optical pickup; and
  - a controller controlling a focusing servo and a tracking servo of the optical pickup,

wherein the optical pickup includes:

- an optical output module having a mount and first and second light sources positioned adjacent to each other on the mount emitting light beams having different wavelengths;

- an objective lens focusing light emitted from the first and second light sources onto two types of optical recording media;

- an optical path conversion unit disposed on an optical path between the optical output module and the objective lens, converting a traveling path of incident light;

- a photodetector receiving the light beams emitted from the first and second light sources, reflected from the optical recording media, and passed through the optical path conversion unit, and detecting a data signal and an error signal; and

- an actuator having a movable member in which the objective lens is installed, and moving the objective lens in a direction to compensate a focusing error signal and a tracking error signal, the actuator rolling the movable member in a case where recording and/or reproduction of data is performed, using a light beam deviated from a main axis of the objective lens among the light beams emitted from the first and second light sources.

15. The optical recording and/or reproducing apparatus of claim 14, wherein the actuator includes:

- a base on which the optical output module, the optical path conversion unit, and the photodetector are installed;

- a holder mounted on the base;

- a plurality of elastic members, each having one end coupled to the holder and another end coupled to the moving member such that the movable member is supported movably, and having different stiffnesses with respect to the center of the objective lens such that the movable member asymmetrically moves in a focusing direction of the optical recording media; and

- a magnetic driving unit driving the movable member in the focusing direction and a tracking direction of the optical recording media due to an electromagnetic force of the magnetic driving unit.

16. The optical recording and/or reproducing apparatus of claim 15, wherein the stiffness of the elastic member positioned nearer an inner circumference of the optical recording media with respect to the radius direction of the optical recording media is different from that of the elastic member positioned nearer an outer circumference of the optical recording media due to a difference in thickness between the plurality of elastic members.

17. The optical recording and/or reproducing apparatus of claim 15, wherein the stiffness of the elastic member positioned nearer the outer circumference is less than that of the elastic member positioned nearer the inner circumference.

18. The optical recording and/or reproducing apparatus of claim 15, wherein the magnetic driving unit includes:

- focusing coils and tracking coils installed on the movable member; and
- a magnet generating the electromagnetic force for driving the movable member in the focusing direction and the tracking direction of the optical recording media due to an interaction between the magnet and a current flowing in the focusing coils, and an interaction between the magnet and a current flowing in the tracking coils.

19. The optical recording and/or reproducing apparatus of claim 15, wherein the actuator includes:

- a base on which the optical output module, the optical path conversion unit, and the photodetector are installed;

- a holder installed on the base;

- a plurality of elastic members, each having one end coupled to the holder and another end coupled to the moving member such that the movable member is movably supported, the length of the elastic member positioned nearer an inner circumference of the optical recording media with respect to the radius direction of the optical recording medium being different from that of the elastic member positioned nearer an outer circumference of the optical recording medium such that the movable member asymmetrically moves in a focusing direction of the optical recording media; and

- a magnetic driving unit driving the movable member in the focusing direction and a tracking direction of the optical recording media by an electromagnetic force.

20. The optical recording and/or reproducing apparatus of claim 19, wherein the length of the elastic member positioned nearer the outer circumference is longer than that of the elastic member positioned nearer the inner circumference.

21. The optical recording and/or reproducing apparatus of claim 19, wherein the magnetic driving unit includes:

    focusing coils and tracking coils which are installed on the movable member; and  
    a magnet generating the electromagnetic force driving the movable member in the focusing direction and the tracking direction of the optical recording media due to an interaction between the magnet and a current flowing in the focusing coils, and an interaction between the magnet and a current flowing in the tracking coils.

22. An actuator for a CD-DVD compatible optical pickup, comprising:  
    an objective lens focusing light emitted from first and second light sources onto two types of optical recording media;

    a movable member, in which the objective lens is installed, moving the objective lens in a direction to compensate a focusing error signal and a tracking error signal according to a light beam deviated from a main axis of the objective lens among light beams emitted from the first and second light sources;

    first and second elastic members, each having one end coupled to a holder and another end coupled to the movable member, and having a different property with respect to the center of the objective lens such that the movable member is asymmetrically movable in a focusing direction; and

    a magnetic driving unit driving the movable member in the focusing direction and a tracking direction of the optical recording media due to an electromagnetic force of the magnetic driving unit.

23. The actuator for the CD-DVD compatible optical pickup according to claim 22, wherein the different property is a different stiffness, due to a difference in thickness of the first elastic member positioned nearer an inner circumference of the optical recording media, with respect to the radius direction of the optical recording media, from that of the second elastic member positioned nearer an outer circumference of the optical recording media.

24. The actuator for the CD-DVD compatible optical pickup according to claim 23, wherein the stiffness of the second elastic member is less than that of the first elastic member.

25. The actuator for the CD-DVD compatible optical pickup according to claim 22, wherein the different property is a different length of the second elastic member positioned nearer the outer circumference with respect to the radius direction of the optical recording media, from that of the first elastic member positioned nearer an outer circumference of the optical recording media.

26. The actuator for the CD-DVD compatible optical pickup according to claim 25, wherein the length of the second elastic member is longer than that of the first elastic member.

27. A method of compensating for focusing and tracking errors during reproduction and recording with a CD-DVD compatible optical pickup, comprising:

receiving and monitoring light emitted from a first and a second light source onto an optical recording medium;

detecting a focusing error using an astigmatic method;

detecting a tracking error by one of a three-light beam method or a differential phase detection method;

deforming first and second elastic members, each having one end coupled to a movable member having an objective lens and another end coupled to a holder, wherein the first elastic member is deformed a different amount than the second elastic member; and

moving the movable member asymmetrically in a focusing direction due to the different deformations of the first and second elastic members.

28. The method according to claim 27, wherein at least one of thickness, length, and stiffness of the first elastic member is different than that of the second elastic member.

29. The method according to claim 27, wherein the moving the movable member is suppressed by an electromagnetic force.

30. An actuator for a CD-DVD compatible optical pickup, comprising:  
an objective lens focusing light emitted from first and second light sources onto two types of optical recording media differing in thickness;

a movable member, in which the objective lens is installed, moving the objective lens in a direction to compensate a focusing error signal and a tracking error signal, according to the difference in thickness of the optical recording media; and

first and second elastic members, each having one end coupled to a holder and another end coupled to the movable member, and having a different physical property with respect to one another such that the movable member is asymmetrically movable in a focusing direction.

31. The actuator for the CD-DVD compatible optical pickup according to claim 30, wherein the difference between the first and the second elastic member is at least one of material, length, stiffness and thickness.

32. The actuator for the CD-DVD compatible optical pickup according to claim 30, wherein the moving is suppressed by an electromagnetic force of a magnetic driving unit.